

Keys to Selected Native and Cultivated Woody Plants
of Madison, Wisconsin



by
Dr. Robert R. Kowal
Department of Botany
University of Wisconsin-Madison

Fall, 1972
revised Fall, 1973
nomenclature revised Summer, 1984

Leaf Arrangement



Opposite



Alternate



Whorled



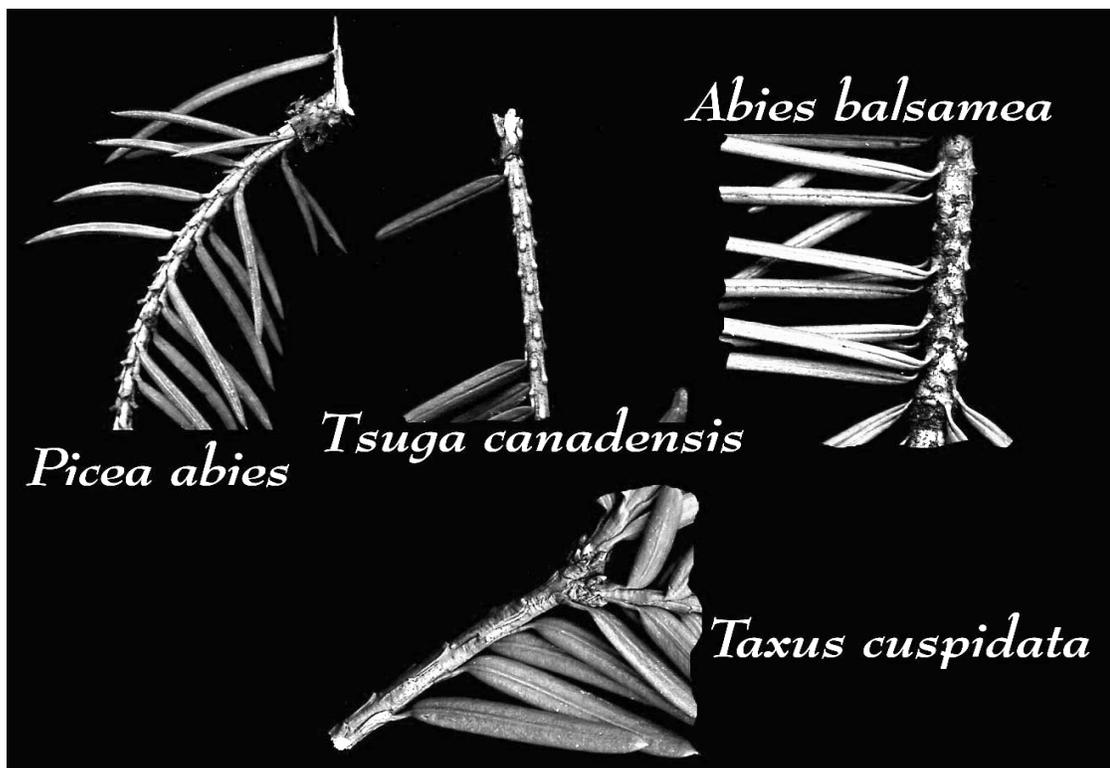
Key I. Identification of Major Groups.

1. Leaves, needles or scales narrower than 1 cm, with 1 or 2 veins **Key II**
(Page 2)
1. Leaves broad and flat, wider than 1 cm, with numerous veins
 2. Trees
 3. Leaves opposite or whorled **Key III**
(Page 4)
 3. Leaves alternate (sometimes apparently whorled on short stubby shoots)
 4. Leaves simple **Key IV**
(Page 6)
 4. Leaves compound **Key V**
(Page 10)
 2. Shrubs or vines
 5. Leaves opposite or whorled **Key VI**
(Page 12)
 5. Leaves alternate (sometimes apparently whorled on short stubby shoots)
 6. Leaves simple **Key VII**
(Page 15)
 6. Leaves compound **Key VIII**
(Page 17)

Key II. Plants with needle-like or scale-like leaves with 1 or 2 veins. Conifers.

1. Leaves in clusters of 2-5 on short shoots, usually sheathed with scales at base..... **Pines**
(*Pinus*)
1. Leaves alternate, opposite, or whorled
 2. Leaves opposite or whorled with 2 or 3 leaves per node
 3. Lateral branches usually deciduous, deciduous tree; leaves opposite, mostly longer than 1.5 cm; leaves flat and flexible..... **Dawn redwood**
(*Metasequoia glyptostroboides*)
 3. Lateral branches persistent; evergreen trees and shrubs; leaves in whorls of 3 or, if opposite, shorter than 1.5 cm; leaves scale-like or awl-shaped, rigid
 4. Branchlets branching in one plane, forming flattened sprays; cones woody, dehiscent..... **American arborvitae**
(*Thuja occidentalis*)
 4. Branchlets forming 3-dimensional sprays; cones berry-like, indehiscent..... **Junipers**
(*Juniperus*)
 2. Leaves alternate (sometimes apparently whorled on spur shoots)
 5. Deciduous trees; leaves thin and flexible
..... **Larch**
(*Larix*)
 5. Evergreen trees and shrubs; leaves thick and rigid
 7. Leaves on current year's twigs usually 4-sided, less than 1.2 mm wide, sharp-pointed, if flattened, then stomata (forming lighter bands on leaf surface) only on upper side; leaves evenly distributed on upper side of twig; older branches roughened by persistent leaf bases..... **Spruces**
(*Picea*)
 7. Leaves flattened, with distinct upper and lower surfaces, usually more than 1.2 mm wide, blunt to sharp-pointed; stomata only on lower side of leaf; leaves tending to spread in one plane

8. Current year's twigs sheathed by green decurrent leaf bases - dioecious shrubs, hardy outdoors; fruit an axillary seed sheathed by a red, fleshy cup.....**Yews**
(*Taxus*)
8. Twigs brown, leaves not conspicuously decurrent
9. Twigs glabrous; buds glazed with resin; cones erect with deciduous scales.....**Fir**
(*Abies*)
9. Twigs minutely pubescent; buds not resinous; cones pendulous with persistent scales
10. Leaves shorter than 1.5 cm; cones shorter than 2.5 cm with bracts much shorter than scales.....**Hemlock**
(*Tsuga canadensis*)
10. Leaves longer than 1.5 cm; cones longer than 5 cm with bracts much longer than scales.....**Douglas fir**
(*Pseudotsuga menziesii*)



Key III. Trees with Opposite or Whorled Leaves.

1. Leaves simple

2. Leaves heart shaped, pinnately veined.....**Catalpa**
(*Catalpa speciosa*)

2. Leaves lobed, palmately veined

3. Leaves with 20 or more points on each side

4. Leaves 5-7 lobed

5. Sinus between lobes U-shaped, extending at least half way to base of leaf blade; leaves strongly whitened beneath**Silver maple**
(*Acer saccharinum*)

5. Sinus between lobes V-shaped, extending less than half way to base of leaf blade; leaves lighter beneath but not strongly whitened.....**Red maple**
(*Acer rubrum*)

4. Leaves 3 lobed.....**Siberian maple**
(*Acer ginnala*)

3. Leaf with not more than 12 points on each side

6. Juice of petiole milky; blade with 7 main veins; buds stout and blunt.....**Norway maple**
(*Acer platanoides*)

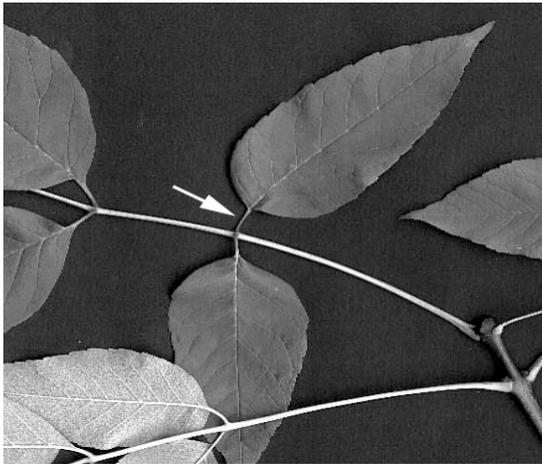
6. Juice of petiole not milky; blade with 3-5 main veins; buds slender and sharp-pointed.....**Sugar maple**
(*Acer saccharum*)

1. Leaves compound

7. Leaves pinnately compound

8 Leaflets 3-5.....**Box elder**
(*Acer negundo*)

- 8. Leaflets 7-11, sometimes 5
 - 9. Leaflets with long, obvious, petiolules.....**White ash**
(*Fraxinus americana*)
 - 9. Leaflets without long, obvious, petiolules
.....**Green/Red Ash**
(*Fraxinus pennsylvanica*)
- 7. Leaves palmately compound
.....**Ohio buckeye**
(*Aesculus glabra*)



White Ash



Green Ash

Key IV. Trees with alternate, simple leaves.

1. Leaves broadly fan-shaped, rounded or notched at tip, with dichotomous venation; spurs (short, stubby branches bearing a cluster of leaves) present; fruit a naked, stinking fleshy-coated seed; gymnosperm.....**Ginkgo**
(*Ginkgo biloba*)
1. Leaves not fan-shaped, acute at tip, with net-venation; seeds enclosed in an ovary; angiosperms
 2. Some or all leaves lobed
 3. Leaves pinnately veined with 1 main vein at base; fruit an acorn
 4. Lobes of leaves not bristle-tipped
 5. Cup of acorn fringed with coarse bristles; upper lobe of leaves much larger than the others.....**Bur oak**
(*Quercus macrocarpa*)
 5. Cup of acorn not fringed; lobes about equal in size.....**White oak**
(*Quercus alba*)
 4. Lobes of leaves tipped by a distinct bristle
 - 6 Sinuses between lobes extending up to halfway to midrib; buds glabrate.....**Red oak**
(*Quercus borealis = Q. rubra*)
 6. Sinuses between lobes extending more than halfway to midrib; buds densely covered with white hairs.....**Black oak**
(*Quercus velutina*)
 3. Leaves palmately veined with 3 main veins from base, many not symmetrical, mitten-shaped; small trees with leaves smaller than oaks; fruit fleshy.....**Mulberry**
(*Morus alba*)
 2. Leaves without lobes
 7. Leaf margin entire.....**Alternate-leaved dogwood**
(*Cornus alternifolia*)

7. Leaf margin toothed

8. Leaves once toothed

9. Leaf blades mostly over 3 times as long as broad

10. Buds with more than one bud scale; older leaves usually with rusty hairs on the lower surface along both sides of the midrib**Wild black cherry**
(*Prunus serotina*)

10. Buds with one bud scale; leaves without rusty hairs beneath base**Willows** (*Salix species*)

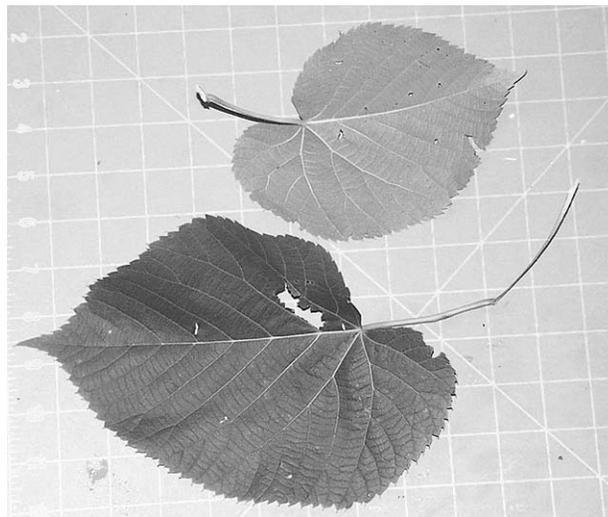
9. Leaf blades less than 3 times as long as broad

12. Petioles cylindrical

13. Leaf base unsymmetrical or oblique; first pair of lateral veins approaching midvein in size so that leaf is palmately veined at base

14. Leaf blade narrow with a long, drawn-out tip; ratio of leaf blade length to width greater than 1.5; bark of trunk stucco-like, with warty growths and ridges.....**Hackberry** (*Celtis occidentalis*)

14. Leaves broadly heart-shaped; ratio of leaf blade length to width less than 1.5; bark not warty.....**Basswood** (*Tilia americana*)



Basswood

13. Leaf base symmetrical; leaves pinnately veined

15. Petioles without glands; buds resinous; bark greenish or light.....**Balsam poplar**
(*Populus balsamifera*)

15. Petioles with glands near blade; buds not resinous; bark dark red, brown, or black, often peeling horizontally

17. Branches unarmed; fruits in racemes; tree up to 25 m tall.....**Wild black cherry**
(*Prunus serotina*)

17. Branches thorny; fruits in clusters of 1-3; small tree or shrub up to 8 m tall
.....**Wild plum**
(*Prunus americana*)

12 Petioles vertically flattened

18. Leaves white-wooly beneath.....**White poplar**
(*Populus alba*)

18. Leaves not white-wooly beneath

19. Leaves egg-shaped, round, or elliptical in overall outline, tending to have rounded margins

20. Leaves finely toothed, with 20-40 teeth per side.....**Trembling aspen**
(*Populus tremuloides*)

20. Leaves coarsely toothed, with 5-15 teeth per side.....**Large-toothed aspen**
(*Populus grandidentata*)

19. Leaves triangular or rhombic in overall outline, tending to have straight margins

21. Mature blades of short branches (not sprouts) 6-12 cm broad, with basal glands..... **Cottonwood**
(*Populus deltoides*)

21. Mature blades 3-8 cm broad, without basal glands.....**Lombardy poplar**
(*Populus nigra*)

8. Leaves doubly toothed, with larger teeth bearing smaller teeth

22. Leaf base not symmetrical

23. Cross-section of bark with alternate layers colored cream and brown; leaves often smooth above.....**American elm**
(*Ulmus americana*)

23. Cross-section of bark uniformly brown; leaves like sandpaper above.....**Slippery elm**
(*Ulmus rubra*)

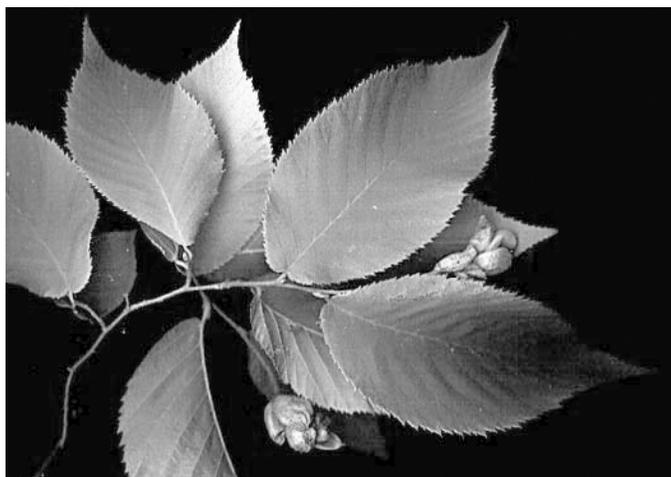
22. Leaf base symmetrical

24. Branches with spurs (short, stubby shoots bearing a cluster of leaves); bark often peeling off in rolls

25. Bark white; twigs without winter- green flavor; leaves mostly with less than 8 pairs of veins.....**White birch**
(*Betula papyrifera*)

25. Bark dirty yellow; twigs with winter-green flavor; leaves with more than 8 pairs of veins.....**Yellow birch**
(*Betula allegheniensis*)

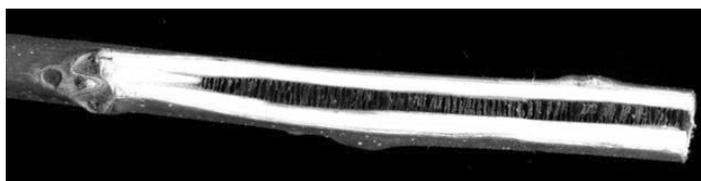
24. Branches without spurs; bark scaly
.....**Hop hornbeam**
(*Ostrya virginiana*)



Hop hornbeam

Key V. Trees with alternate, compound leaves.

1. Some or all leaves twice compound
 2. Leaflet margin without teeth; thorns absent.....**Kentucky coffee tree**
(*Gymnocladus dioica*)
 2. Leaflet margin with teeth; stout thorns usually present on trunk.....**Honey locust**
(*Gleditsia triacanthos*)
1. Leaves once compound
 3. Lateral buds hidden beneath base of petiole
 4. Leaflet margin without teeth; node usually with a pair of spines.....**Black locust**
(*Robinia pseudo-acacia*)
 4. Leaflet margin with teeth; twigs usually with simple or branched thorns.....**Honey locust**
(*Gleditsia triacanthos*)
 3. Lateral buds evident, axillary
 5. Larger leaflets narrower than 3 cm; leaves not glandular-hairy; fruits berry-like**European mountain ash**
(*Pyrus aucuparia*)
 5. Larger leaflets wider than 3 cm; leaves often glandular-hairy; fruit a nut
 6. Pith chambered; mostly more than 4 pairs of lateral leaflets (range: 3-8 pairs)
 7. Leaf-scars without hairy fringe along upper margin; end leaflet often absent; fruit round**Black walnut**
(*Juglans nigra*)
 7. Leaf-scars with hairy fringe along upper margin; end leaflet usually present; fruit oblong**Butternut**
(*Juglans cinerea*)



Chambered Pith

- 6. Pith continuous; mostly less than 4 pairs of lateral leaflets (range: 2-4 pairs)
 - 8. Bud-scales yellow, not overlapping, mostly 3 pairs of lateral leaflets.....**Bitternut Hickory**
(*Carya cordiformis*)
 - 8. Bud-scales brown, overlapping, mostly 2 pairs of lateral leaflets.....**Shagbark Hickory**
(*Carya ovata*)



C. ovata on the left
C. cordiformis on the right

Key VI. Shrubs or vines with opposite or whorled leaves.

- 1. Leaves palmately compound.....**Bottlebrush Buckeye**
(*Aesculus parviflora*)

- 1. Leaves pinnately compound
 - 2. Pith white.....**Common elder**
(*Sambucus canadensis*)

 - 2. Pith orange.....**Red-berried elder**
(*Sambucus racemosa* ssp. *pubeus*)

- 1. Leaves simple
 - 3. Leaves palmately lobed
 - 4. Petioles with stipules near stem and glands near base of blade; fruit a drupe.....**Cranberry-bush**
(*Viburnum opulus*)

 - 4. Petioles without stipules and glands; fruit a samara.....**Siberian maple**
(*Acer ginnala*)

 - 3. Leaves not lobed
 - 5. Leaf margin entire
 - 6. Leaves ovate, with cordate to truncate base and long-tapering tip.....**Common lilac**
(*Syringa vulgaris*)

 - 6. Leaves rounded to acute at base and tip
 - 7. Leaves with lateral veins arching towards tip and running somewhat parallel with margin
 - 8. Leaves with 6-8 pairs of lateral veins; twigs streaked with purple.....**Round-leaved dogwood**
(*Cornus rugosa*)

 - 8. Leaves mostly with fewer than 6 pairs of lateral veins; twigs not streaked

- 9. Branches purplish or red; inflorescence almost flat-topped.....**Red-osier dogwood**
(*Cornus stolonifera*)
- 9. Branches gray; inflorescence elongate, with red pedicels.....**Gray dogwood**
(*Cornus racemosa*)
- 7. Leaves with lateral veins ending near margin and not running toward apex
 - 10. Petiole bases of opposite leaves not joined by a transverse line; bark not peeling.....**Privet**
(*Ligustrum species*)
 - 10. Petiole bases of opposite leaves joined by a transverse line or meeting; bark on older branches peeling off in long, shreddy pieces
 - 11. Twining vine; pair of leaves subtending flowers joined at base**Smooth-leaved honeysuckle**
(*Lonicera dioica*)
 - 11. Stout, upright shrub; no leaves joined at base**Tartarian honeysuckle**
(*Lonicera tatarica* X *L. morrowii* complex)
- 5. Leaf margin toothed
 - 12. Petiole bases of opposite leaves joined by a transverse line or meeting
 - 13. Buds embedded under petiole base; not axillary; fruit a capsule.....**Mock-orange**
(*Philadelphus sp.*)
 - 13. Buds not embedded, axillary
 - 14. Mostly shorter than 1 m; with hairy ridge running down from transverse line connecting petiole bases; fruit a capsule.....**Bush honeysuckle**
(*Diervilla lonicera*)

14. Mostly taller than 1 m; without ridge; fruit a drupe.....**Nannyberry (*Viburnum lentago*)**
12. Petiole bases of opposite leaves not joined by a distinct transverse line, not meeting
15. Evergreen, trailing or climbing shrub; unarmed; fruit a capsule enclosing seeds with a fleshy, orange coat
.....**Wintercreeper (*Euonymous fortunei*)**
15. Deciduous, upright shrub; some twigs ending in spines; fruit a black berry.....**Buckthorn (*Rhamnus cathartica*)**



Viburnum lentago

Key VII. Shrubs or vines with alternate simple leaves.

1. Leaves lobed

2. Vines

3. Tendrils present

4. Tendrils without adhesive pads. Leaves with three or five lobes

.....**Riverbank grape**
(*Vitis riparia*)

4. Tendrils with adhesive pads. Leaves with three lobes

.....**Boston Ivy**
(*Parthenocissus tricuspidata*)

3. Tendrils absent.....Moonseed

(*Menispermum canadense*)

2. Erect shrubs

5. Older bark separating in numerous thin layers; fruit an inflated capsule.....Ninebark

(*Physocarpus opulifolius*)

5. Older bark tight; fruit a berry

6. Leaves with minute, yellow dots on both surfaces; wild.....Wild black currant

(*Ribes americanum*)

6. Leaves without such dots;

cultivated.....Mountain currant
(*Ribes alpinum*)

1. Leaves not lobed

7. Stems with spines

8. Spines at nodes; leaves entire.....Japanese barberry

(*Berberis thunbergii*)

8. Thorn at end of most twigs; leaves

toothed.....Buckthorn

(*Rhamnus cathartica*)

7. Stems unarmed

9. Vines.....American bittersweet

(*Celastrus scandens*)

9. Erect shrubs

10. Leaf margin entire.Alternate-leaved dogwood

(*Cornus alternifolia*)

10. Leaf margin toothed

11. Each bud covered by a single hood-like scale

.....**Willow**
(*Salix* species)

11. Each bud covered by 2 or more scales

12. Twigs and petioles with coarse, gland-tipped hairs standing perpendicular to surface; fruit a nut.....**American hazelnut**
(*Corylus americana*)

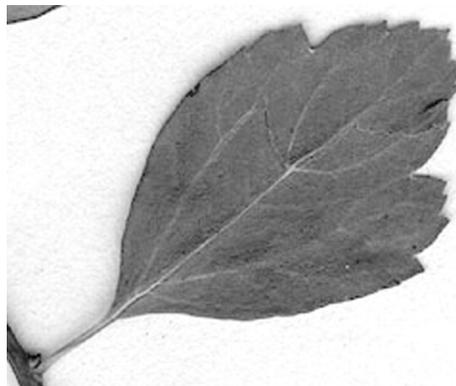
12. Twigs and petioles without such hairs; fruit fleshy or capsule-like

13. Petioles with one or more glands near upper end.....**Chokecherry**
(*Prunus virginiana*)

13. Petioles without glands

14. Base of leaf wedge-shaped; fruit dry, like a capsule.....**Bridal wreath**
(*Spiraea X vanhouttei*)

14. Base of leaf rounded or heart-shaped; fruit fleshy, like a berry.....**Shadbush**
(*Amelanchier* species)



Spiraea X vanhouttei

Key VIII. Shrubs or vines with alternate, compound leaves.

1. Plants with spines, thorns, or bristles

- 2. Stipules absent; crushed leaves and bark with aromatic fragrance.....**Prickly ash**
(*Zanthoxylum americanum*)
- 2. Stipules present; plant not aromatic
 - 3. Leaves green beneath; leaf margin evenly toothed; stipules conspicuous and fused with petiole for over half their length.....**Rose**
(*Rosa sp.*)
 - 3. Leaves white beneath; leaf margin coarsely, often doubly toothed; stipules inconspicuous, not strongly fused with petiole
 - 4. Stems erect, covered with bristly hairs; fruit red.....**Red raspberry**
(*Rubus idaeus*)
 - 4. Stems arching, often rooting at tips, covered with stout-based prickles; fruit black.....**Black raspberry**
(*Rubus occidentalis*)

1. Plants unarmed

- 5. Leaves palmately compound with more than 3 leaflets; vines with tendrils.....**Virginia creeper**
(*Parthenocissus quinquefolia*)
- 5. Leaves pinnately compound or with 3 leaflets; shrubs or vines without tendrils
 - 6. Leaves with 3 leaflets; fruits white; causes dermatitis.....**Poison ivy**
(*Toxicodendron radicans*)
 - 6. Leaves with more than 3 leaflets; fruits red; not poisonous
 - 7. Leaves and twigs hairy.....**Staghorn sumac**
(*Rhus typhina*)
 - 7. Leaves and twigs glabrous.....**Smooth sumac**
(*Rhus glabra*)



Poison Ivy

GLOSSARY

Compiled by Allen Prunty, fall, 1978

- achene.** A dry indehiscent fruit with thin pericarp fitting closely around seed.
- acuminate.** Long-tapering to a pointed apex or base.
- acute.** Sharp-pointed
- alternate.** Describing the arrangement of leaves or other structures which occur singly at successive nodes or levels; not opposite or whorled.
- awl-shaped.** Tapering from a narrow base to a point.
- axil.** Angle formed by one structure with another, as a leaf with a stem.
- axillary.** In the axil.
- berry.** A fruit with a fleshy pericarp.
- bipinnate.** Twice pinnately compound.
- blade.** The expanded, more or less flat portion of a leaf.
- cordate.** Heart-shaped.
- deciduous.** Descriptive of a plant whose leaves fall off at the end of one growing season.
- dehiscent.** Splitting open, usually in some regular way.
- diaphragmed (pith).** With transverse partitions or plates.
- dichotomous.** Two forked.
- dioecious.** Descriptive of a species having female and male flowers on separate plants.
- drupe.** An indehiscent fruit with outer portion of pericarp fleshy and inner portion of pericarp stony (e.g., cherry).

entire (margin). Unbroken by indentations.

evergreen. With green leaves throughout the year.

glabrate. Becoming glabrous with age; nearly glabrous.

glabrous. Without hairs.

indehiscent. Not opening.

internode. Region of stem between two nodes.

lanceolate. Lance-shaped; widest above base, tapering to apex, several times as long as wide.

lateral. On side (side branches or buds, veins to the side of the midvein).

leaflet. One of the divisions of the blade of a compound leaf.

legume. A dry fruit of one carpel dehiscent along a suture and midrib (e.g., pea).

lobed. Separated by indentations (sinuses) into segments (lobes) larger than teeth.

midrib. Midvein.

monoecious. Descriptive of a species having separate female and male flowers on same plant.

node. Short zone of stem where leaf or leaves are borne.

nut. A hard indehiscent one-seeded fruit (e.g., acorn).

ob- Prefix meaning in an opposite direction; thus obovate is inversely ovate.

oblique. With unequal sides; not at right angles to; slanting.

oblong. Longer than wide, the sides nearly or quite parallel and ends rounded.

obtuse. Blunt.

opposite. Two at a node or at same level of an axis or rachis.

oval. Broadly elliptic.

ovate. Having the shape of a median longitudinal section through an egg, with widest portion below the middle.

ovoid. Egg-shaped.

palmately compound. With leaflets all arising at apex of petiole.

palmately veined. With principal veins diverging from top of petiole.

pinnate (leaf). Compound with leaflets along a rachis.

pinnately compound. Pinnate.

pinnately veined. With one main vein, the midvein, from which principal lateral veins branch.

pubescent. Hairy.

raceme. Elongate inflorescences with each flower on a pedicel.

rachis. Axis of a pinnately compound leaf; sometimes used, also, to mean the axis of an inflorescence.

sinus. Indentation between lobes or teeth.

spur. Short, stubby branches bearing a cluster of leaves.

tendrils. A slender coiling segment of a leaf or stem.

thorn. A sharp-pointed stem or branch of a stem.

venation. Arrangement of veins.

whorl. A group of 3 or more leaves or other structures at a node.

Leaf Venation



Palmate



Pinnate



Parallel

Leaf Margins



Entire



Toothed
(once toothed)

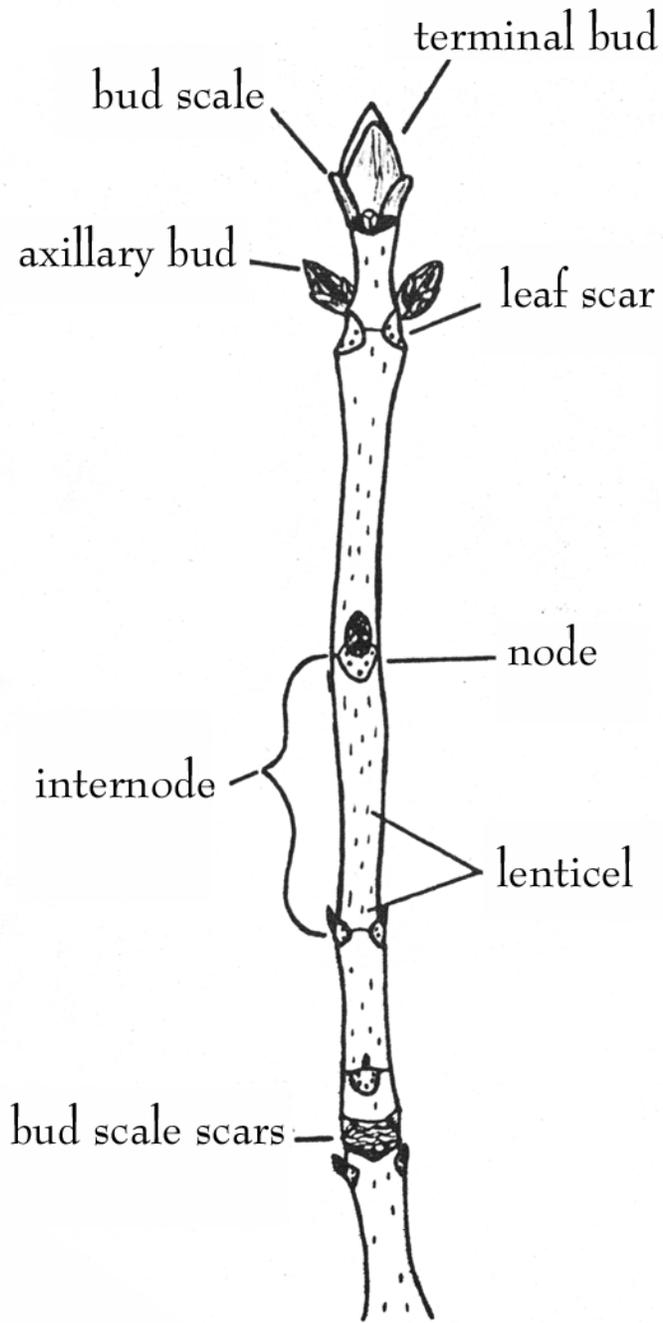


Doubly
Toothed



Lobed

Stems



Pith Types

